

REMARKS

Applicant thanks the Examiner for the very thorough consideration given the present application.

Claims 1-7 are now present in this application. Claim 1 is independent.

Amendments have been made to specification. Reconsideration of this application, as amended, is respectfully requested.

I. Priority Under 35 U.S.C. § 119

Applicant thanks the Examiner for acknowledging Applicants' claim for foreign priority under 35 U.S.C. § 119, and receipt of the certified priority document.

II. Objection to the Drawings

The Examiner has objected to the drawings because the labels contain a number of misspellings and for failing to comply with 37 C.F.R. 1.84(p)(5) because they include reference character(s) not mentioned in the description.

In order to overcome this objection, Applicant is concurrently submitting Replacement Drawing Sheets for the Examiner's approval, which address each of the deficiencies pointed out by the Examiner. Accordingly, reconsideration and withdrawal of this objection are respectfully requested.

III. Specification Objection

The Examiner has objected to the specification for the reasons set forth in the Office Action.

In order to overcome this objection, Applicant has amended the specification in order to correct the deficiency pointed out by the Examiner. In addition, a Substitute Specification is being provided in order to place the application in better form. Also included is a marked-up copy of the original specification which shows the portions of the original specification which are being added and deleted. Applicant respectfully submits that the substitute specification includes no new matter and that the substitute specification includes the same changes as are indicated in the marked-up copy of the original specification showing additions and deletions. Reconsideration and withdrawal of this objection are respectfully requested.

IV. Allowed Claims

Applicant thanks the Examiner for the early indication of allowed claims 1-7 in this application.

V. Cited References

Since the references cited by the Examiner have not been utilized to reject the claims, but have merely been cited to show the state of the art, no comment need be made with respect thereto.

VI. Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone James T. Eller, Jr., Registration No. 39,538, at (703) 205-8000, in the Washington, D.C. area.

Prompt and favorable consideration of this Response is respectfully requested.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit

Application No.: 09/760,839
Art Unit 2614

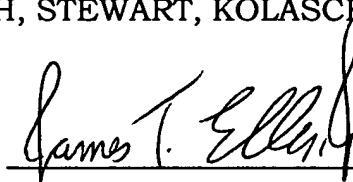
Attorney Docket No. 0465-0807P
Response filed October 12, 2004
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Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By:



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Attachment(s): Replacement Drawing Sheets
Annotated Drawing Sheets
Substitute Specification (with marked-up copy)

Marked-Up Version



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APPARATUS FOR PROCESSING DATA OF PROGRAM GUIDE

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates generally to digital broadcasting, and more particularly to an apparatus for processing program guide data.

Description of the Related Art

In a digital broadcast, video and audio streams are compressed
10 into digital information to be broadcast, and system information and program information are compressed in accordance with the program and system information protocol (PSIP) standard to be broadcast.

The PSIP is the ATSC standard for terrestrial and cable digital broadcasting, wherein an electrical program guide and system
15 information are defined as one information. That is, the PSIP is defined to provide diverse information on programs by parsing messages
^{q/n}
encoded by MPEG-2 system (Moving Picture Experts Group ; ISO/IEC
₁
13818-1 system) (1977 DEC., Document A/65).

Specifically, the PSIP includes several tables so that it can
20 transmit/receive audio/video (A/V) data prepared in an AC-3 audio format and in an MPEG-2 video format, respectively, and transmit information on channels of respective broadcasting stations and information on respective programs of the channels.

As described above, the PSIP supports a primary function of

providing an A/V service of a desired broadcasting program of a selected channel, and a supplementary function of providing an electronic program guide (EPG) for a broadcasting program, i.e., a broadcasting program guide service. At this time, channel information for channel selection and information such as a packet identifier (PID) for receiving the A/V signal are transmitted through a virtual channel table (VCT), and EPG information of broadcasting programs of respective channels are transmitted through an event information table (EIT), respectively.

The EIT includes information on events of the virtual channel (i.e., such as title, start time, etc.), and one event is a typical television program. The PSIP includes 4 EITs at minimum, and 128 EITs at maximum, and the respective EIT provides event information for a specified period of time.

As described above, the electronic program guide (EPG) for displaying information on a televised program in a digital television (TV) receiver has various presentation types through a table where a plurality of sections are combined for the convenience in interface with a user.

One among the well-known electronic program guide (EPG) types
is the ~~gemster~~ ^{Gemstar} table type.

Also, the digital satellite system (DSS) of DIRECTV, that has the highest market share among the United States satellite broadcasting systems, serves an APG(Advanced Program Guide) that is higher than

the existing EPGs in level. Accordingly, the development of a transport demultiplexer (TP) for effectively processing the APG data has been pressed.

Now, the operation of the conventional TP structure for processing
5 the PSI of MPEG, which has the similar structure and contents to
the APG, will be explained.

The above-described TP filters the PSI data inputted in the
unit of a packet through a PID_filter and a section_filter. At this
time, one section_header is mapped to one PID (one PID may be mapped
10 to various section_headers).

The data having passed the filter is stored, being classified
according to kinds of section_headers set in a section_filter, and
thus buffers are provided as many as the number of the section_headers
that can be set.

15 In this case, the size of the respective buffer should be at
least twice the maximum length of the section.

The conventional TP structure as shown in FIG. 1, however, has
the following problems.

For convenience' sake, the TP that can set 32 PIDs and 32
20 section_headers is ~~example~~ shown.
^

First, since it is generally possible to ~~masking~~ ^ the
section_filter, only a portion of fields of the section_headers
can be actually set. Thus, one set section_header can be combined

with several PIDs.

That is, the section matches the PID 0, PID 1, or PID 2, and the filtering may be performed only when the matched PID matches the header 0 of the section_filter.

5 However, according to the structure of the conventional data processing apparatus, since only one PID matches one section_header, the section_header 0 having the same PID_filter matches the PID 0, PID 1, and PID 2 of the PID-filter one by one, and thus three section_headers should be set in total. This results in that only
10 29 headers among 32 headers remain to be set.

As described above, according to the conventional TP, since the section_header matches only one PID even if the TP has a memory that enables 32 headers to be set, this causes 32 memories not to be used in full if the header value is set twice or more. However,
15 since various kinds of objects are inputted to the APG, the kinds of frame_headers to be set become great, and thus it is difficult that the frame filter performs its own function well.

Second, since the number of buffers for storing the PSI data should be always equal to that of headers of the section_filter,
20 the size of the buffer becomes massive.

In this case, the size of the buffer becomes $32x$ (i.e., the size determined by the user: the minimum size whereby the buffer becomes not in full), and this causes a stumbling block in reducing the size of hardware.

As a result, the conventional program guide data processing apparatus has the following disadvantages.

First, since one section_header matches only one PID, the memory for setting the headers cannot be used in full.

Second, since the number of buffers for storing the PSI data is always equal to the number of headers of the section_filter, the total size of the buffer becomes massive, and it is difficult to reduce the size of hardware.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to an apparatus for processing data of a program guide that substantially obviate one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a program guide data processing apparatus which can effectively use a frame_filter by effectively combining SCIDs of an SCID_filter (corresponding to the conventional PID_filter) and frame_headers of a frame_filter (correponding to the conventional section_filter).

It is another object of the present invention to provide a program guide data processing apparatus which can reduce the size of a buffer for storing APG data by effectively using the buffer.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention.

The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims thereof as well as the appended drawings.

To achieve these and other advantages and in accordance with
5 the purpose of the present invention, as embodied and broadly described,
the program guide data processing apparatus has the feature that
the SCID_filter (PID_filter) and the frame_filter (section_filter)
are in a multi-to-multi correspondence, and at least one SCID
corresponding to a respective header of the frame_filter is provided
10 in order to set the multi-to-multi correspondence.

The program guide data processing apparatus includes an
SCID_filter section including a plurality of SCIDs for receiving
A/V data provided in an A/V signal format, a frame_filter section,
composed of a plurality of headers, for being mapped on the SCID-filter
15 section in a multi-to-multi correspondence so that at least one of
the headers corresponds to the plurality of SCIDs, and a memory section
for forming a buffer for each of the SCIDs, and storing program guide
data in the unit of a frame.

Preferably, the size of a buffer for storing APG data is '(the
20 number of APG_SCIDs)*(the size of the buffer set by a user : the
minimum size whereby the buffer is not in full)'.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further

understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

5 In the drawings:

FIG. 1 is a view illustrating a conventional program guide data processing apparatus.

FIG. 2 is a view illustrating a program guide data processing apparatus according to the present invention.

10 FIG. 3 is a view illustrating an example of a register which represents the matching between an SCID_filter and a frame_filter according to the present invention.

15 FIG. 4 is a view illustrating another example of a register which represents the matching between an SCID_filter and a frame_filter according to the present invention.

FIG. 5 is a view illustrating the construction of a register read by a host when APG data is transmitted to a buffer according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

20 Reference will now be made in detail to the program guide data processing apparatus according to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings.

FIG. 2 is a view illustrating a program guide data processing

apparatus according to the present invention.

The program guide data processing apparatus of the present invention includes an SCID_filter section including a plurality of SCIDs for receiving A/V data provided in an A/V signal format, a 5 frame_filter section, composed of a plurality of headers, for being mapped on the SCID-filter section in a multi-to-multi correspondence so that at least one of the headers corresponds to the plurality of SCIDs, and a memory section for forming a buffer for each of the SCIDs, and storing program guide data in the unit of a frame. The 10 respective header in the frame_filter section includes a frame_header section for representing an inherent value of the corresponding header, an SCID_number section having at least one SCID set in the respective frame_header section, and a mask section for selecting a mask of the corresponding header.

15 FIG. 3 is a view illustrating an example of a register which represents the corresponding relation between an SCID_filter and a frame_filter according to the present invention.

Referring to FIG. 2, the SCIDs of the SCID_filter and frame_headers of the frame_filter are mapped in a many-to-many correspondence.

20 On the basis of the frame_filter, the frame_header 0 (i.e., section_header 0) corresponds to SCID 0, SCID 1, and SCID 2. Thus, as shown in FIG. 3, the SCID_number of the frame_header 0 is set with 0x0, 0x1, and 0x2.

The frame_header 1 to frame_header 31 are also set in the same

manner as above. Here, only the frame_header 0 is considered.

According to the conventional apparatus, since the frame_header 0 corresponds to SCID 0, SCID 1, and SCID 2, respectively, through three times settings, the kinds of the set frame_headers actually 5 becomes smaller even though the frame_filter having the same size is used.

Also, since various kinds of objects (i.e., kinds of tables in concept) are inputted to the APG, the kinds of frame_headers to be set become great, and thus in case of conventionally implementing 10 the APG, it is difficult that the frame filter performs its own function well.

Meanwhile, it can be defined according to the existing condition how many SCID_numbers are prepared in one frame_header.

As described above, the SCID_filter (PID_filter) and the 15 frame_filter (section_filter) are in a multi-to-multi correspondence, and at least one SCID corresponding to the respective header of the frame_filter is provided in order to set the multi-to-multi correspondence. At this time, if the SCID value is set, 12 bits are required for each ~~ACID~~^{SCID}, and thus the order set in the SCID_filter, 20 i.e., the number of the SCID register, can be written instead of the set value.

For example, if it corresponds to the SCID set in the SCID_register 3, 3 is set. Accordingly, if the frame_filter corresponds to 32 SCIDs, only five bits are allocated for each SCID.

As described above, the register for setting the matching relation between the SCID_filter and the frame_filter sets the index matched to the SCID on the basis of the frame_filter as a figure. However, it may be more preferable that the index is set by matching the 5 frame_header on the basis of the SCID_filter, not on the basis of the frame_filter.

That is the reason why the SCID filtering is performed prior to the frame filtering.

At this time, by representing the index as a bit map rather 10 than directly writing the index in the register, more diverse matching relations can be represented with a smaller-sized register.

According to another embodiment as explained later, the index matched to the frame_header on the basis of the SCID_filter is set as a 32-bit bit map.

15 In detail, the SCID_filter can be constructed as shown in FIG. 4. Referring to FIG. 4, the SCID_filter includes a plurality of SCIDs indicating inherent values of the corresponding SCIDs, and a 32-bit bit map matched to at least one frame_header. The 32-bit bit map is set at a position matched to in the order of the frame_headers.

20 Accordingly, in a set case such as SCID 0, the frame_filters 0, 2, and 5 are matched to the SCID 0. Thus, data that has passed one of the frame_filters 0, 2, and 5 among data having passed the SCID 0 in the SCID_filters will be the final data.

Next, the storage of the APG data in the buffer will be explained.

The TP should transmit the APG data in the unit of a frame, being classified by SCIDs and frame_headers.

According to the conventional apparatus, a separate buffer is employed for each SCID and frame_header. On the contrary, according 5 to the present invention, in order to reduce the size of the buffer, the matched SCID number and frame_header number are written in the register read by the host when the APG data is transmitted, instead of employing the separate buffers.

The structure of the register is illustrated in FIG. 5.

10 Meanwhile, another frame does not start before one frame is completed in one SCID. However, another frame may start before one frame is completed if the frames have different SCIDs.

Accordingly, a buffer is allocated for each SCID, and the required size of the buffer becomes '(the number of APG_SCIDs)*(the size of 15 the buffer set by the user : the minimum size whereby the buffer is not in full)'.

When the arrival of the frame is recognized, the SCID that matches the frame and the register number of the frame_header are also recognized along with a frame_start_point, and a frame_end_point.

20 Now, the operation of the program guide data processing apparatus according to the present invention as constructed above will be explained in detail with reference to the accompanying drawings.

As shown in FIG. 2, the frame_header 0 to frame_header 5 correspond

to the SCID 1 to SCID 3 in a multi-to-multi manner. Since the number of the corresponding SCIDs are 4 at maximum, the size of the buffer becomes '4*(the minimum size whereby the buffer is not in full)'.

Specifically, 4 SCID registers, 6 frame_header registers, and
5 4 buffers whose size is '4*(the minimum size whereby the buffer is not in full)' are required. However, in implementing this by the conventional structure, 4 SCID registers, 11 frame_header registers, and 11 buffers whose size is '11*(the minimum size whereby the buffer is not in full)' are required. This requires the settings of the
10 frame_headers and separate buffers as many as the number of arrows shown in FIG. 2.

Accordingly, in implementing the frame_filter in the same manner, the structure according to the present invention can reduce the number of the frame_header registers and the size of the buffer in comparison
15 to the conventional structure.

As described above, the program guide data processing apparatus according to the present invention has the following advantages.

First, the size of the frame_filter and buffer can be reduced.

Second, since more kinds of frame_headers can be filtered in
20 case of using a frame_filter having the same size, the performance can be improved in case of the APG having much more kinds of frame_headers.

Third, the apparatus can be applied to the TP for processing

different EPG data.

Fourth, in case that a section_filtering is performed in the TP, the size of the section_filter and buffer can be reduced by applying the present invention thereto.

5 While the present invention has been described and illustrated herein with reference to the preferred embodiment thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention.

10

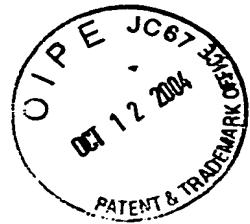
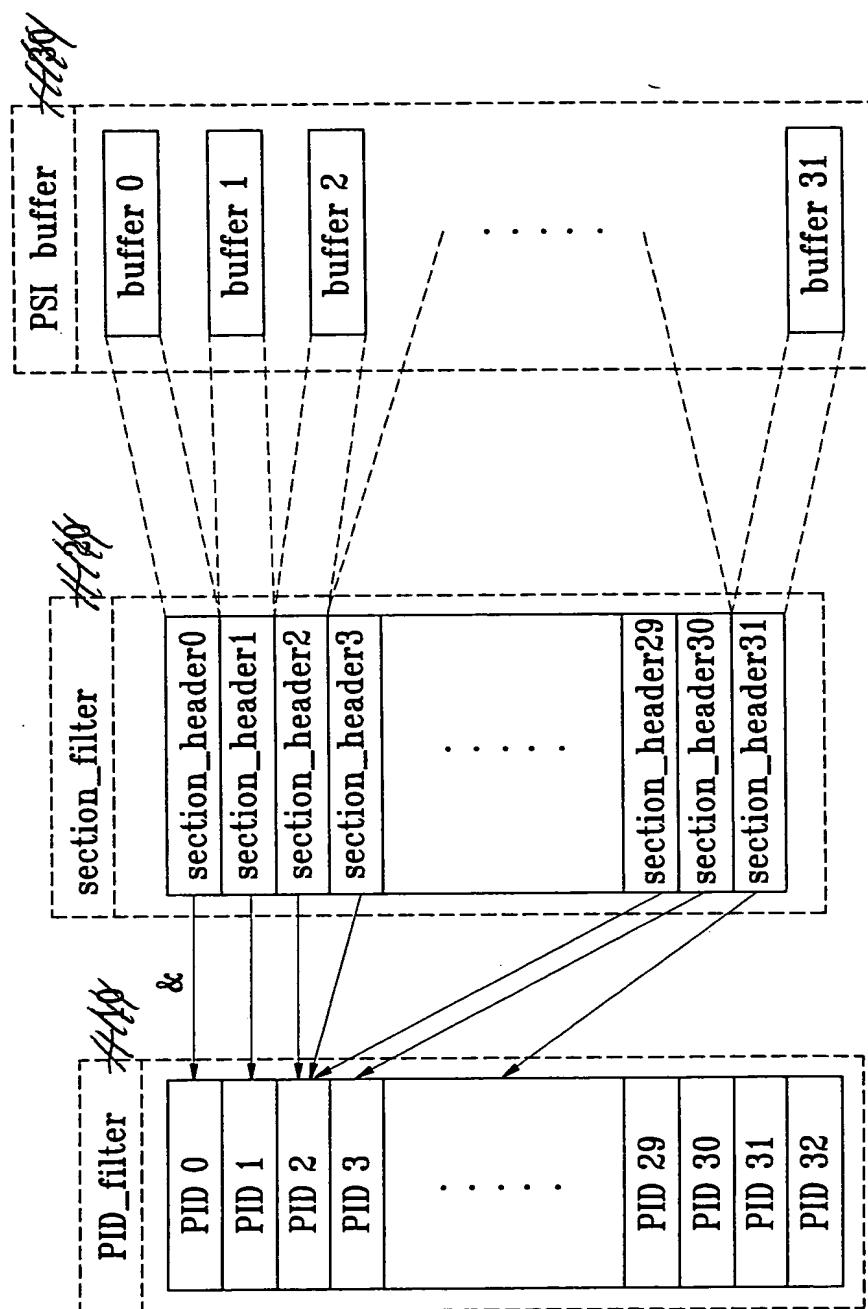


FIG.1 Related Art



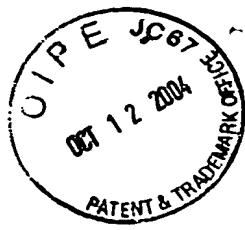


FIG.2

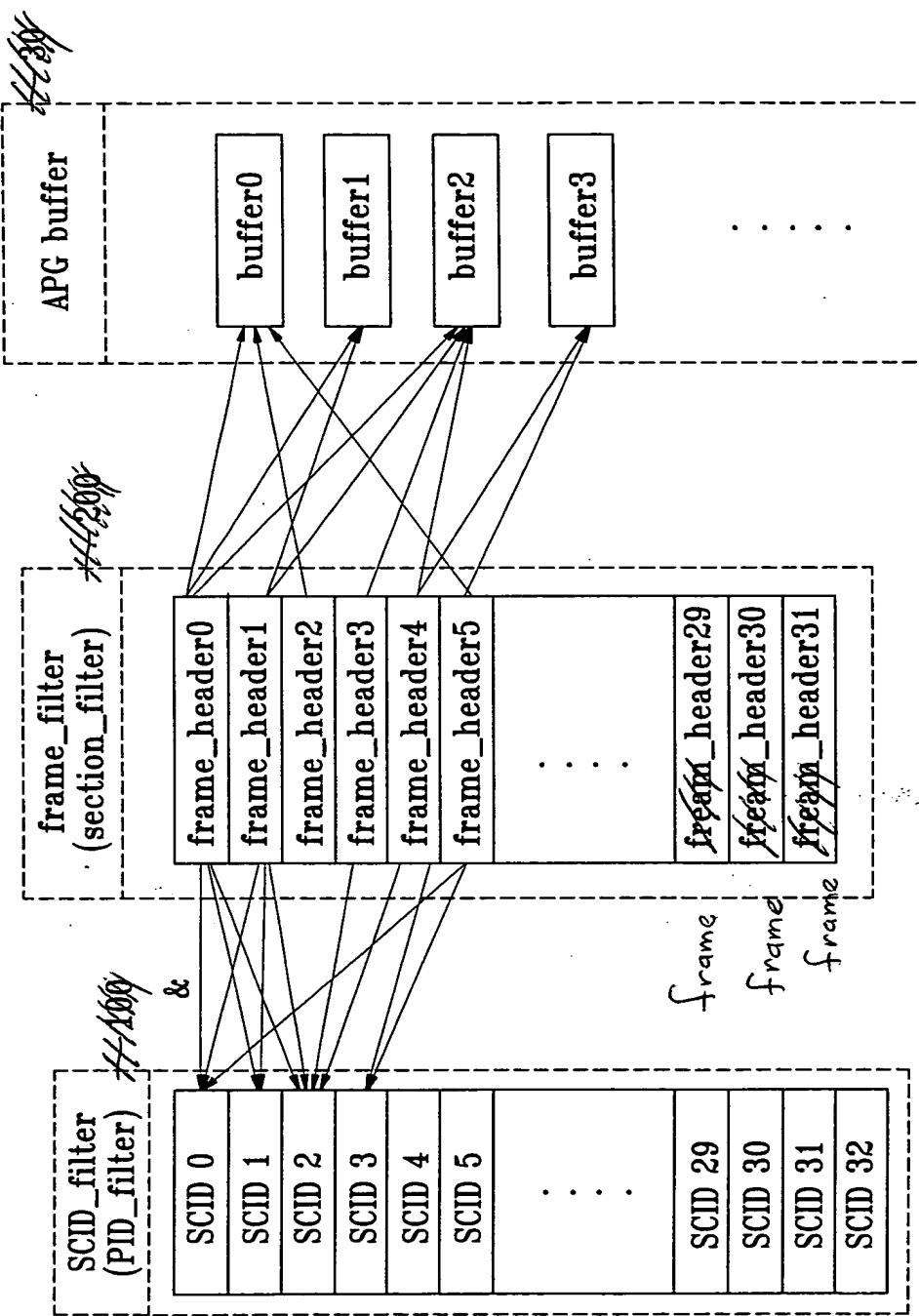




FIG.3

frame_header 0	SCID_number (5 bits) ex)0×0	SCID_number (5 bits) ex)0×1	SCID_number (5 bits) ex)0×2	SCID_number mask_bits (3 bits)
frame_header 1	SCID_number (5 bits) ex)0×1	SCID_number (5 bits) ex)0×2	SCID_number (5 bits) ex)None	SCID_number mask_bits (3 bits)
frame_header 2	SCID_number (5 bits) ex)0×0	SCID_number (5 bits) ex)None	SCID_number (5 bits) ex)None	SCID_number mask_bits (3 bits)
frame_header 3	SCID_number (5 bits) ex)0×2	SCID_number (5 bits) ex)None	SCID_number (5 bits) ex)None	SCID_number mask_bits (3 bits)
frame_header 4	SCID_number (5 bits) ex)0×2	SCID_number (5 bits) ex)0×3	SCID_number (5 bits) ex)None	SCID_number mask_bits (3 bits)
⋮				
frame_header 30	SCID_number (5 bits) ex)0×7	SCID_number (5 bits) ex)0×15	SCID_number (5 bits) ex)None	SCID_number mask_bits (3 bits)
frame_header 31	SCID_number (5 bits) ex)0×14	SCID_number (5 bits) ex)0×15	SCID_number (5 bits) ex)0×1a	SCID_number mask_bits (3 bits)